Express Mail No. EV388908697US

PATENT APPLICATION OF

JAMES H. PAGE
WILLIAM A. WRIGHT
EDWARD LARSON

ENTITLED

PRE-TENSIONED SPRING TRACK TENSIONING SYSTEM

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BACKGROUND OF THE INVENTION

The present invention relates to a pre-tensioned spring for loading a track tensioning roller for a ground drive track on a track laying vehicle or track drive system that provides two different levels of tensioning loads. A lower track tension is provided for normal operation, and a higher track tension is provided to prevent detracking and buckling of the track during high tractive effort conditions or when debris is forced between the track and the drive sprocket, idlers or track support rollers.

Ground support and drive tracks are used in various vehicles, for good traction and flotation. The tracks are endless members driven by a drive wheel or sprocket, and supported on a plurality of rollers on a lower length of the track. The track has to be kept under tension, and heavy springs or hydraulic or grease filled cylinders have been used for such purposes.

Some track tensioners utilize two separate springs to attempt to provide for two-level tensioning. For example, springs provided in series, one of which is lesser force than the other, are utilized as a shock absorber in Japanese abstract No. JP 55156773. The assignee of the present application owns Patent No. 6,322,171 which shows a spring loaded

track tensioning assembly. However, a reliable two stage spring system is desired for providing a lower average track tension for normal use, and higher tension only when it is needed.

SUMMARY OF THE INVENTION

The present invention relates to a tensioner or tensioning roller for vehicle drive tracks, which has a two stage spring system for providing a lower spring load to cause track tension loading at a lower level under normal operating conditions. After initial movement of the tensioner against the initial or primary spring load, a second higher spring rate is provided to load the track to reduce movement of the tensioner, and thus reduce the likelihood of track buckling or the risks of detracking. Buckling of the track and detracking during higher track effort conditions, such as when digging or when debris is forced between the track member and its drive sprocket, roller or an idler is reduced.

The lower initial track tension reduces the bearing side load on the track supports, and in particular, loads on the motor bearing that is used in a motor driving the track drive sprocket. In most cases, the sprocket is attached right on the motor output shaft.

The present tension system has particular use in a "high" drive track arrangement where the drive sprocket is at the rear of the track and is

elevated to be above the tensioning roller, so that the track forms a generally triangular configuration.

The present tensioner or tensioning roller is easily manufactured and installed, and is very reliable for providing the two stage loading. It is also lower cost than existing hydraulic or grease cylinder designs that are commonly utilized for track tensioning.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a schematic side elevational view of the typical track frame assembly with which the spring tensioner of the present invention finds particular use with parts broken to show the tensioner;

Figure 2 is a perspective view of the track tensioner removed from the track support frame with a slide broken away to show springs;

Figure 3 is a sectional view of a track tensioner arm with the secondary or higher force spring in position in a slide;

Figure 4 is a sectional view taken on line 4--4 in Figure 3;

Figure 5 is a sectional view of the higher force or secondary spring assembly taken along line 5--5 in Figure 3 to illustrate the sliding arrangement for the movement of the spring;

Figure 6 is a sectional view of the two springs used for the tensioner in an assembly;

Figure 7 is an enlarged view of the primary or lower force spring and its mounting relative to the secondary spring;

Figure 8 is a fragmentary perspective exploded view of a lock for the spring adjustment device; and

Figure 9 is a fragmentary perspective view of a portion of a track frame showing a spring end support arrangement.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

In Figure 1, the track frame indicated generally at 10 is supported on a vehicle frame 12, such as a small utility loader, or other vehicle. The track frame has side plates 14, and as shown, a drive motor 16 is mounted on the track frame 10 and the output shaft of the motor 16 has a drive sprocket 18 drivably mounted thereon. The drive sprocket 18 in the form shown is at the upper side of the track frame 10, and an endless drive track shown at 20 extends downwardly in a forward direction from the drive sprocket 18 to a front idler roller 22. This front idler roller 22 is rotatably mounted on the track frame 10, and guides the track so that there is a ground engaging lower length section indicated at 24 that is supported on bogie wheels or track rollers 26 of conventional or any preferred design. The track 20, which is an endless track, is passed around a tensioner or tensioning roller 28, that is mounted

onto a tension spring loading assembly 30 made according to the present invention.

The track frame has suitable cross members between side walls 14 such as wall 32, and also there are guides 34 that will support the track tensioner arm or slide 36. The track tensioner arm 36 includes a pair of flanges 38 that are joined with a cross plate 39. The flanges 38 are spaced apart to receive the track tensioner roller 28 on a suitable shaft 40. The shaft 40 can be mounted on suitable bearings, or can be a shaft that does not rotate, and the tensioning roller itself can be rotating on the shaft.

The tensioner arm 36 includes a slide housing 42 that is rectangular in cross sectional shape and which will slide between the wall 32 and the guides 34, which include sections that are spaced apart to form a suitable guide and support for the slide housing 42.

The housing 42 has a fixed end member 44 that is also part of a large spring assembly. The flanges 38 are fixed to slide 42 and end member 44. The track tensioning roller 28 is loaded to provide tension in the track with a spring assembly 46 that is within slide 42. The springs used react or provide force on member 44 which is reacted through a suitable end plate 48 that is fixed relative to the side plates 14 of the track frame 10 (see Figure 8). A threaded rod 50 has an adjustment hub 52 fixed to

one end. The hub 52 has a hexagon periphery nut 53 that fits through an opening in the end plate 48, and a circular flange 52A that bears against the inside surface of the end plate 48.

The threaded rod or shaft 50 extends rearwardly from plate 48 into the slide housing 42. The spring assembly 46 includes a first relatively low force or light rate spring 54 that is supported over a fixed length tubular sleeve 56 (see Figure 7) that surrounds the portion of the threaded shaft 50 between a threaded adjusting nut 58 and a slide block 60 that forms part of a secondary or large spring assembly 62.

The large spring assembly 62 is shown in Figure 5 in section. The spring assembly 62 includes a base plate 44, that was shown in Figure 1 and which is held or secured relative to the side plates 38 and the slide housing 42. Plate 44 will react force from a heavy duty or high rate spring 64 as load on the track increases, as will be explained.

The base plate 44 also carries a centering shaft 66 that fits within the spring 64 to keep it in position between the base plate 44 and the sliding block 60. A pair of guide rods 68 are fixed to the base plate 44 by welding them in place or the like, but they slide through provided openings in the slide plate 60, and are held at a fixed, desired length relative to the base plate 44 by welding or securing

stops 70 on the guide rods 68 outside of the sliding plate 60.

Thus, the spring 64 can be preloaded by compressing the spring by loading the slide plate 60 and securing the stops 70. The spring is then trapped between the base plate 44 and the sliding plate 60 at a desired preload. The sliding plate 60 has a central bore 72 that slidably receives the end of shaft 50.

As can be seen in Figures 1 and 7, the shaft 50 is supported by the hub 52, and is prevented from sliding forwardly by plate 48. The nut 58 as well as the spring 54 and the sleeve 56 form an assembly. The slide housing 42, carrying the end flanges 38, roller 28 and the spring assembly shown in Figure 4 can be inserted into the track frame between the guides including the wall 32 and the guides 34A. The track can then be put onto drive sprocket and rollers. The nut 58 can be threaded along threaded shaft 50 to loosen the spring 54 so the tensioner can be moved and the track can be assembled. Then the nut 58 can be threaded by rotating shaft 50 using hub 52 and hex nut end 53, so it can be tightened to apply a spring force on the tensioning roller 28. Once the initial setting is made, the track will be initially tensioned by force exerted by the lower force spring 54.

It can be seen that once the track load increases tending to retract the spring loaded

tensioner and compress spring 54 in the direction as indicated by the arrow 76, the lighter spring 54 will carry the load or resistance until the end surface 55 (Figure 7) of the tube 56 strikes the slide plate 60, at which time spring 54 will no longer compress, and any further movement of the idler roller 28 in direction as indicated by the arrow 76 will result in compression of the spring 64.

Spring 64 is a very stiff, high load spring, so that the track is loaded to the extent necessary without excessive compression of the springs and resulting movement of the tension roller 28 that would result in loosening the track and perhaps letting it buckle or detrack. The nut 58 is the adjustment that makes the setting for the initial tension on the tension roller 28. The nut 58 is held from rotation by a rectangular plate 59 in the sleeve 42 and can be adjusted by rotating shaft 50 and hub 52. The circular flange 52A permits the shaft 50 to rotate by using a wrench on the hex end 53. The hex end can be rotated from the exterior in a suitable manner through a side opening 14A in the outer side plate 14. The nut 58 is pre-set to a desired position on the threaded shaft 50.

As shown in Figures 7 and 8, the hub can be held from rotating by using a lock plate 80 that has an opening of size and configuration to fit over the hex nut 53 of the hub 52. When supported against the front of plate 48 and held in place with a capscrew

82 threaded into a bore in plate 48, the hex nut 53 and hub 52 cannot rotate. Thus, the threaded rod 50 will not rotate to loosen the spring. The spring setting remains constant.

The amount of movement before the end of the sleeve 56 engages the slide plate 60 after adjustment of the spring is relatively small, and in the order of 0.10 inch. For example, the spring 50 can provide a load of approximately 1,200 pounds before the tensioner compresses enough so that the sleeve or spacer 56 strikes the slide plate 60, and then there is a solid compression carrying link between the nut 58 and the slide plate 60, so any further movement of the tensioner in direction of arrow 76 will result in the spring 64 being compressed. The spring 64 initial force is pre-set by adjusting the length of the slide rods 68, and is generally pre-set at 2,000 pounds.

Although the present invention has been described with reference to preferred embodiments, workers skilled in the art will recognize that changes may be made in form and detail without departing from the spirit and scope of the invention.